

Science and Technology Honors Program

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The Science and Technology Honors Program at UAB revolutionizes the undergraduate experience. Acceptance to the program places students in the company of fellow scholars and world-renowned researchers. Science and Technology Honors (STH) students synthesize ideas from multiple disciplines to tackle real, meaningful scientific problems. The unique, four-year STH curriculum of coursework, seminars, mentored research, and leadership challenges builds community and sharpens scientific thinking.

This unique program is the only one of its kind in Alabama. It is designed for the best and brightest students whose academic and extracurricular achievements demonstrate intellectual curiosity, energy, creativity, and leadership abilities. Graduates of the STH Program are well prepared for graduate study at the Master's or Doctoral level as well as for professional school.

Mission

To prepare scientific leaders of the next generation by engaging students in interdisciplinary classroom, leadership, research, and innovation experiences which culminate in the dissemination of new scientific knowledge.

Vision

- UAB's Science and Technology Honors Program will recruit a diverse group of talented undergraduate students, involve faculty from across the university as teachers and mentors, and provide a unique educational experience for students.
- Through interdisciplinary courses and laboratory research experiences, STH students will be exposed to the power of integrating multidisciplinary approaches and will apply this perspective to research and innovation problems.
- STH students will be trained in scientific thinking and communication and will conduct and disseminate original research or scholarship under the supervision of a faculty mentor.
- STH graduates will be well prepared for graduate and professional study and will show evidence of leadership in academic, economic, and policy areas related to science and technology during their careers.

Benefits

Students in the STH Program work closely with research faculty and participate in original scientific research. During the first two years, the program prepares students with the knowledge and skills they need to get started in research. Beginning as early as the freshman or sophomore year, students work closely with a faculty mentor on an individualized project, learning about research and innovation through

apprenticeship. STH students are encouraged to attend national conferences and to publish their research in scientific journals.

The program is a closely knit community with approximately 50 undergraduate students admitted each year. The small number encourages collaboration among students, interaction with faculty, and sharing of ideas. Students receive priority registration and take science and technology focused sections of core courses such as English Composition II (EH 102). In addition, STH students can earn graduate credit, providing an advantage when pursuing an advanced degree.

Coursework

The academic portion of the Science and Technology Honors Program builds upon UAB's research strengths in science and technology. Special interdisciplinary courses such as Introduction to the Scientific Process (STH 199), the Interdisciplinary Seminar (STH 299), Big Ideas in Science and Innovation (STH 240), and Current Challenges in Translating Science into Benefit (STH 340) examine topics from many scientific and technical perspectives, illustrating how scientists integrate multiple fields of study when approaching research and development questions.

Students discover the methodologies and techniques used in a variety of research areas, including biology, cell biology, chemistry, molecular genetics, computer and information systems, engineering, neuroscience, psychology, physics, and more. In their Research Approaches (STH 201) course, students get hands-on experience in laboratory techniques and generate original data for presentation at the UAB Expo.

Exclusive seminars such as the Interdisciplinary Seminar (STH 299) put students face to face with UAB's best known researchers who share their insights and experiences from the lab and the field. The entire curriculum is designed to encourage independent thinking, questioning of ideas, innovative problem-solving, and skill in scientific communication. STH coursework also integrates seamlessly with honors programs in science and technology majors.

The program culminates in a two-year intensive research experience under the direction of a UAB faculty member. Students build upon the methods they have learned in their courses and seminars to propose and conduct an independent research or innovation project in collaboration with their faculty mentor. This project becomes the student's Honors Thesis. The Honors Thesis is prepared for publication in a scientific journal and for presentation at a national conference. Thus, many STH students will both publish a scientific paper and present at a national conference before graduating from UAB. Students in the program must complete thirty (30) credit hours of honors coursework, which includes at least 6 credit hours of independent research under the direction of a faculty mentor to complete their Honors Thesis research requirement.

The Honors Thesis may also take the form of a capstone or clinical innovation project developed in consultation with and approval of the program director.

- A capstone project draws together students' experience and is useful for students planning career paths other than bench research. Students will delineate the scope of the project, resources needed, and the anticipated product. The project could be proposed by a team of students with the scope adjusted and the expectation that several students will contribute.
- The clinical innovation pathway allows students to develop expertise in applied innovation within medical settings through a series of courses that provide exposure to clinical settings and guide them through a client-centered design process. The final product may

include a working prototype, patent application, or business plan, depending on the scope of the proposed project. Students will have the option to develop an idea into a project either as an individual or as part of a team.

Who Should Apply

This program is best suited for students who are intensely curious about science and excited about the prospect of becoming a generator of new knowledge in their field. In addition to curiosity about science, successful applicants generally have a strong academic record and plan to pursue a career in science or technology. STH students typically have a GPA of 3.5 or higher in their high school academic courses and ACT or SAT scores at or above the 90th percentile in math and science. Because the program values diversity and strives to accommodate talented students, applications are reviewed individually and applicants are personally interviewed.

Students interested in applying to STH must first be admitted to the UAB Honors College. Following admission to the College, interested students may then submit an application to the STH Program. This application and accompanying recommendation must be received by the published deadline. For more information on applying to the Honors College or its Specialized Programs, visit <http://www.uab.edu/honors>.

STH Signature Courses

Each student in the program takes the following STH Program coursework during their first two years in the program to prepare for their independent research experience:

- Introduction to the Scientific Process (STH 199). Fall semester of freshman year. Students work in teams to analyze current scientific problems under investigation by UAB faculty, learning about how scientists approach problems and conduct their research, including ethics and institutional review of human and animal research.
- Research Approaches (STH 201). Spring semester of freshman year. Systematic training in foundational research methodologies and applying methods in research laboratories. Students choose among biotechnology training, advanced chemical analysis, or engineering design and materials analysis.
- Interdisciplinary Seminar (STH 299). Fall semester of sophomore year. This course illustrates the synergy achieved by interdisciplinary analysis of problems. Example topics include High Voltage Innovation, Neurobiology of Learning and Memory, Energy Generation and Conservation, Disorders of the Central Nervous System, Creating a Culture of Sustainability, Data Modeling, and Immunotherapy.
- Leadership Project Planning (STH 151) and Prime Time Leadership (STH 250). Spring semester of freshman year and fall or spring semester of sophomore year, respectively. This two-course leadership preparation sequence teaches students to apply leadership and teamwork skills to analyze a problem or need and develop a plan, to address the need, and then to carry through the resulting project. Students develop measurable outcomes, communicate with stakeholders, document the project's outcome, and prepare for a public presentation of the project.
- Big Ideas in Science and Innovation (STH 240). Sophomore or junior year. This course will integrate skills developed in STH 199, STH 201, STH 299, and EH 102/202 to examine current controversies and challenges in science and technology. Students will analyze scientific research and explore the "conversation" between scientists and other

constituencies regarding the interpretation and application of the findings.

- Current Challenges in Translating Science into Benefit (STH 340). Junior or senior year. This course will build upon students' research experiences by exploring the spectrum of basic to applied research in which each investigation is embedded. Through reading original scientific papers and using technical databases, students will explore "wicked problems" and develop innovative solutions.

Curriculum - Research Track 1

To graduate with *High Distinguished Honors in Science and Technology*, students must complete 30 semester hours of designated honors coursework with a 3.5 GPA overall or better; Students who complete 30 or more of designated honors coursework with an overall GPA between 3.0 and 3.49 will graduate with *Honors in Science and Technology*.

Requirements		Hours
First-Year Honors Seminar		
STH 199	Introduction to the Scientific Process	3
Scientific and Technical Communication^a		
EH 102	English Composition II (honors section focused on Scientific and Technical Communication)	3
or EH 202	English Composition II: Scientific and Technical Communication	
Research Methods and Applications		
STH 201	Research Approaches	3
Advanced Honors Seminars		
STH 240	Big Ideas in Science and Innovation	1
STH 299	Interdisciplinary Seminar	3
STH 340	Current Challenges in Translating Science into Benefit	1
Leadership Preparation		
STH 151	Leadership Project Planning	1
STH 250	Prime Time Leadership	1
Statistics^b		
Students must complete an approved statistics course. PUH 250 (Biostatistics) is highly recommended, especially the honors section.		
Honors Proposal and Thesis Seminars		
STH 395	Honors Proposal Preparation	1
STH 400	Honors Thesis Preparation	1
Honors Research		
Minimum number of research credit hours required (choose one of the following) ^{c, d}		6
STH 398	Honors Research	
STH 399	Honors Thesis Research	
Total Hours		24

a Students should take an honors section of EH 102 focused on scientific and technical communication (usually designated by "STH" following the course title) either in the fall or spring semester of the first year, depending on whether they come to UAB already having earned credit for EH 101. Students who come to UAB with credit for both EH 101 and EH 102 should instead take the cross-listed course EH 202, usually in their first semester. **In any case, a student should take either EH 102 or EH 202 at UAB but not both.**

b Students may satisfy the statistics requirement by earning credit for any statistics course approved by the program director, e.g., PY 216 Elementary Statistical Methods or BME 423 Living Systems Analysis

and Biostatistics. Alternative credit through AP or IB may also be accepted if approved by the program director.

- c Students must have a minimum of six (6) research credit hours comprised of any combination of STH 398 and/or STH 399. Research credit may be earned in fall, spring, and/or summer semesters in any increments as chosen by students at their convenience. In some cases, students may be allowed to substitute **up to three (3) of the six (6)** required research credit hours with equivalent research credit course(s) in the department of their major with approval of the program director. All honors research credit applies to the thirty (30) hours of honors credit needed to complete the program.
- d Students completing a capstone or innovation thesis instead of a traditional research thesis may substitute STH 394 and/or STH 397 in place of research credit hours. The number and type of hours needed to fulfill this requirement will depend on the thesis plan developed with and approved by the program director. In all cases, a cumulative total of 30 credit hours of honors coursework must still be earned.

Curriculum - Capstone - Track 2

The Science and Technology Honors Program is offering a Capstone Track 2 Curriculum of 18 credit hours of designated honors coursework that requires a student to complete a capstone project instead of a the 6 credit hours of research and associated thesis in the 30 credit hours of designated coursework in the Research Track 1 Curriculum.

More specifically, the student would be required to complete the following credit hours in the Capstone Track 2 Curriculum.

Requirements	Hours
Signature Courses	
STH 199 Introduction to the Scientific Process	3
STH 201 Research Approaches	3
STH 151 Leadership Project Planning	1
STH 250 Prime Time Leadership	1
STH 240 Big Ideas in Science and Innovation	1
or STH 340 Current Challenges in Translating Science into Benefit	
Additional Courses	
EH 102 English Composition II	3
or EH 202 English Composition II: Scientific and Technical Communication	
Approved Statistics Course	3
Honors Proposal and Capstone Seminar	
STH 395 Honors Proposal Preparation	1
STH 401 Honors Capstone	2
Total Hours	18

Students must complete the aforementioned coursework of 18 credit hours of designated honors coursework with a 3.5 GPA overall or better to graduate with *Distinguished Honors in Science and Technology*, or complete additional designated honors coursework to a total of 30 (or more) credit hours with a 3.5 GPA overall or better to graduate with *High Distinguished Honors in Science and Technology*. Students who complete at least 18 credit hour of designated honors coursework with an overall GPA between 3.0 and 3.49 will graduate with *Honors in Science and Technology*.

Optional STH Electives

Requirements	Hours
STH 220 Special Topics in Science and Technology	1-3
STH 310 Communicating Science	1-3
STH 320 Advanced Topics in Science and Technology	1-3
STH 350 Next Level Leadership	1-3
STH 390 Preparation for STEM Teaching	0-3
STH 394 Clinical Innovation Seminar	0-3
STH 396 Internships/Community Projects/SL	1-3
STH 397 Independent Study	1-3
STH 410 Innovation Internship	0-3
STH 490 Practicum in STEM Teaching	0-3

Proposed Program of Study for Science and Technology Honors Students *

Freshman			
First Term	Hours	Second Term	Hours
STH 199		3 STH 201	3
EH 102 or 202 [†]		3 STH 151	1
			6
			4
Sophomore			
First Term	Hours	Second Term	Hours
STH 299		3 Approved Statistics Course [‡]	
STH 250	1		
			4
			0
Junior			
First Term	Hours	Second Term	Hours
STH 240		1 STH 395	1
STH 398 [§]		2 STH 398 [§]	1
			3
			2
Senior			
First Term	Hours	Second Term	Hours
STH 340		1 STH 400	1
STH 399 [§]		2 STH 399 [§]	1
			3
			2

Total credit hours: 24

Explanation of Footnotes

- * Students choose **6** hours of honors elective coursework to reach the overall total of 30 hours of honors coursework required for completion of the program.
- † Students should take an honors section of EH 102 focused on scientific and technical communication (usually designated by "STH" following the course title) either in the fall or spring semester of the first year, depending on whether they come to UAB already having earned credit for EH 101. Students who come to UAB with credit for both EH 101 and EH 102 should instead take the cross-listed course EH 202, usually in their first semester. **In any case, a student should take either EH 102 or EH 202 at UAB but not both.**
- ‡ Biostatistics (PUH 250) is highly recommended to fulfill the statistics requirement, particularly the honors section. Students may also satisfy this requirement by taking any statistics course approved by the program director, e.g., Elementary Statistical Methods (PY 216) or Living Systems Analysis and Biostatistics (BME 423). Alternative credit

through AP or IB may also be accepted if approved by the program director.

§ Students must have a minimum of six (6) research credit hours comprised of any combination of STH 398 and/or STH 399. Research credit may be earned in fall, spring, and/or summer semesters in any increments as chosen by students at their convenience. In some cases, students may be allowed to substitute **up to three (3) of the six (6)** required research credit hours with equivalent research credit course(s) in the department of their major with approval of the program director. All honors research credit applies to the thirty (30) hours of honors credit needed to complete the program.

Courses

STH 151. Leadership Project Planning. 1 Hour.

Students will apply leadership and teamwork skills to analyze a problem or need and develop a plan to address the need. Skills such as developing measurable outcomes and communicating with stakeholders are emphasized.

STH 199. Introduction to the Scientific Process. 3 Hours.

Fall semester of freshman year. First-year Honors Seminar for students accepted in the Science and Technology Honors Program. Discussion of basic concepts of scientific methodology will be integrated with analysis of scientific journal articles and use of visual representations to communicate ideas. Students learn about research ongoing at UAB through working with a small team to analyze a scientific publication. The course will culminate in presentation of a poster representing their analysis of the article.

STH 201. Research Approaches. 3 Hours.

Spring semester of freshman year. Hands-on experience with research methods. Students participate in a lab experience such as biotechnology, engineering, molecular genetics, or chemical analysis in which they learn state-of-the-art techniques used in research laboratories.

STH 220. Special Topics in Science and Technology. 1-3 Hour.

Explore topics that span multiple scientific or technical disciplines addressing pertinent theoretical, practical, and ethical issues.

STH 240. Big Ideas in Science and Innovation. 1-3 Hour.

Seminar that builds on scientific thinking skills developed in previous STH courses. In this course, students will examine science as a way of knowing. We will explore the relationship between scientific research and the public conversation around a topic. Both primary scientific and popular press sources will be considered.

STH 250. Prime Time Leadership. 1-3 Hour.

Carry through leadership or innovation project. Document outcome of the project, report to stakeholder, and prepare public presentation of project.

Prerequisites: STH 151 [Min Grade: C]

STH 299. Interdisciplinary Seminar. 3 Hours.

Fall (or sometimes Spring) semester of sophomore year. Students will learn and explore how complex problems are addressed by multiple disciplines. This course will illustrate the synergy achieved by interdisciplinary analysis of problems.

STH 310. Communicating Science. 0-3 Hours.

Students will collaborate with university faculty and staff to produce media products which communicate scientific concepts to the public. Permission of instructor is required.

STH 320. Advanced Topics in Science and Technology. 1-3 Hour.

Analyze advanced issues that span multiple scientific or technical disciplines addressing pertinent theoretical, practical, and ethical issues.

STH 340. Current Challenges in Translating Science into Benefit. 1-3 Hour.

Seminar to address current challenges and controversies in science and its translation into application. Students will examine the spectrum from basic science foundations through translational research to applications, for example, in medicine or energy policy. Students hone skills in analyzing original scientific papers and using technical databases. Teams of students will develop a proposal for next steps in a translational challenge.

STH 350. Next Level Leadership. 1-3 Hour.

Oversight of team organized to sustain leadership or innovation project.

Prerequisites: STH 250 [Min Grade: C]

STH 390. Preparation for STEM Teaching. 0-3 Hours.

Student will assist in course instruction through working with student teams on assigned projects. Student is required to attend scheduled preparatory sessions each week, assist in teaching the assigned course section, help develop student assignments, and assist the course instructor in other capacities as assigned. Students work under the direction of the course instructor. Student must have completed the course in which the student is assisting with a grade of B or higher or have equivalent experience. Permission of the instructor is required. May be repeated for credit up to a maximum of three (3) credit hours.

STH 394. Clinical Innovation Seminar. 0-3 Hours.

Students will rotate through clinical settings to identify problems in instrumentation or procedure that impede quality or efficiency. Students will analyze these problems and develop proposals for solutions. Prototypes may be produced.

STH 395. Honors Proposal Preparation. 1-2 Hour.

Seminar for students who are preparing to propose their honors thesis research project and have worked in a lab for a minimum of one semester. Students will present and discuss their research plans and provide input into the proposals of classmates. Honors thesis research proposals will be completed by the end of the semester and defended before a faculty committee. Students must have permission of the program director if they have not completed at least one semester of mentored research prior to taking this course.

STH 396. Internships/Community Projects/SL. 0-6 Hours.

Experiential learning through individually designed community based or clinically related experiences. Each project will have both experiential and academic components. Permission of program director is required.

STH 397. Independent Study. 0-6 Hours.

Individually designed academic course of study under the direction of a selected faculty member. Permission of the program director is required.

STH 398. Honors Research. 0-6 Hours.

Laboratory research under the supervision of a faculty mentor. Permission of program director is required.

STH 399. Honors Thesis Research. 0-6 Hours.

Undergraduate research for student's honors thesis project under the supervision of a faculty mentor. Students may register for this course after approval of their honors thesis proposal in STH 395.

Prerequisites: STH 395 [Min Grade: C]

STH 400. Honors Thesis Preparation. 1-2 Hour.

Students will prepare their honors thesis in the format of a journal article during this course and present it to their faculty committee for approval.

Prerequisites: STH 395 [Min Grade: C]

STH 401. Honors Capstone. 2 Hours.

Students complete a capstone project and prepare a written paper and oral presentation for approval by their faculty committee.

STH 410. Innovation Internship. 0-3 Hours.

The first semester of this internship will be unpaid during which the student commits 12-20 hours/week to work with the company to which they are matched. The student and company representatives will develop an internship agreement which specifies the expectations for time commitment, frequency of review or supervisory meetings, and any other parameters which are felt to be important by the company representatives. A midterm review will be completed by a representative of the company and the student, and an end of term evaluation will be completed jointly by the student and the company supervisor. The internship does not obligate the student to continue to work with the company after the designated internship semester; however, after the initial internship semester, it is possible for the student to continue their work with the company on either a volunteer or a paid basis. Whether students continue to work with the company as volunteers or as paid employees, they may repeat STH 410 and earn additional credit hours toward their STHP designation.

Prerequisites: (STH 199 [Min Grade: C] or BY 213 [Min Grade: C]) and (STH 201 [Min Grade: C] or CH 201 [Min Grade: C] or BY 214 [Min Grade: C]) and EH 102 [Min Grade: C]

STH 490. Practicum in STEM Teaching. 0-3 Hours.

Student will assist in course instruction through working with student teams on assigned projects and will serve in the "lead assistant" role. Student is required to attend scheduled preparatory sessions each week, assist in teaching the assigned course section, help develop student assignments, and assist the course instructor in other capacities as assigned. Students work under the direction of the course instructor. Student must have completed the course in which the student is assisting with a grade of B or higher or have equivalent experience and have completed at least 1 credit hour of STH 390. Permission of the instructor is required. May be repeated for credit up to a maximum of three (3) credit hours.

Prerequisites: STH 390 [Min Grade: P] or STH 390 [Min Grade: B]